

FORM PTO 1300 (REV. 11-2000)	U.S. DEPARTMENT OF COMMERCE PATENT AND TRADEMARK OFFICE  <b>TRANSMITTAL LETTER TO THE UNITED STATES          DESIGNATED/ELECTED OFFICE (DO/EO/US)          CONCERNING A FILING UNDER 35 U.S.C. 371</b>	ATTORNEY DOCKET NUMBER  825-163
		U.S. APPLICATION NO. (if known, see 37 CFR 1.9) <b>10/089268</b>

INTERNATIONAL APPLICATION NO. PCT/EP00/09564	INTERNATIONAL FILING DATE September 29, 2000	PRIORITY DATE CLAIMED September 30, 1999
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**TITLE OF INVENTION**  
SHAFT SEAL, IN PARTICULAR FOR AN AXIAL PISTON COMPRESSOR

**APPLICANT(S) FOR DO/EO/US**  
OTFRIED SCHWARZKOPF

Applicant herewith submits to the United States Designated/Elected Office (DO/EO/US) the following items and other information:

- ☐ This is a **FIRST** submission of items concerning a filing under 35 U.S.C. 371.
- ☐ This is a **SECOND** or **SUBSEQUENT** submission of items concerning a filing under 35 U.S.C. 371.
- ☐ This is an express request to begin national examination procedures (35 U.S.C. 371(f)). The submission must include items (5), (6), (9) and (21) indicated below.
- ☐ The US has been elected by the expiration of 19 months from the priority date (Article 31).
- ☐ A copy of the International Application as filed (35 U.S.C. 371(c)(2))
  - ☐ is attached hereto (required only if not communicated by the International Bureau).
  - ☐ has been communicated by the International Bureau.
  - ☐ is not required, as the application was filed in the United States Receiving Office (RO/US).
- ☒ A English language translation of the International Application as filed (35 U.S.C. 371(c)(2)).
  - ☒ is attached hereto.
  - ☐ has been previously submitted under 35 U.S.C. 154(d)(4).
- ☐ Amendments to the claims of the International Application under PCT Article 19 (35 U.S.C. 371(c)(3))
  - ☐ are attached hereto (required only if not communicated by the International Bureau).
  - ☐ have been communicated by the International Bureau.
  - ☐ have not been made; however, the time limit for making such amendments has NOT expired.
  - ☐ have not been made and will not be made.
- ☐ A English language translation of the amendments to the claims under PCT Article 19 (35 U.S.C. 371(c)(3)).
- ☐ An oath or declaration of the inventor(s) (35 U.S.C. 371(c)(4)).
- ☐ A English language translation of the annexes of the International Preliminary Examination Report under PCT Article 36 (35 U.S.C. 371(c)(5)).

**Items 11 to 20 below concern other document(s) or information included:**

- ☐ An Information Disclosure Statement under 37 CFR 1.97 and 1.98.
- ☐ An assignment document for recording. A separate cover sheet in compliance with 37 CFR 3.28 and 3.31 is included.
- ☒ A **FIRST** preliminary amendment.
- ☐ A **SECOND** or **SUBSEQUENT** preliminary amendment.
- ☐ A substitute specification.
- ☐ A change of power of attorney and/or address letter.
- ☐ A computer-readable form of the sequence listing in accordance with PCT Rule 13ter.2 and 35 U.S.C. 1.821-1.825.
- ☐ A second copy of the published international application under 35 U.S.C. 154(d)(4).
- ☐ A second copy of the English language translation of the international application under 35 U.S.C. 154(d)(4).
- ☐ Other items or information:
  - ☐ Applicant claims small entity status.
  - ☒ Supplement to Transmittal Letter.

U.S. APPLICATION NO. (if known, see 37 CFR 1.5) <div style="font-size: 1.5em; font-weight: bold; margin-top: 5px;">10/089268</div>		INTERNATIONAL APPLICATION NO. PCT/EP00/09564		ATTORNEY'S DOCKET NUMBER 825-163	
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21. <input type="checkbox"/> The following fees are submitted: <div style="margin-top: 5px;"> <b>Basic National Fee (37 CFR 1.492(a)(1)-(5)):</b>            Neither international preliminary examination fee (37 CFR 1.482) not international search fee (37 CFR 1.445(a)(2)) paid to USPTO and International Search Report not prepared by the EPO or JPO..... \$ 1,040.00             International preliminary examination fee (37 CFR 1.482) not paid to USPTO but International Search Report prepared by the EPO or JPO..... \$ 890.00             International preliminary examination fee (37 CFR 1.482) not paid to USPTO but international search fee (37 CFR 1.445(a)(2)) paid to USPTO ..... \$ 740.00             International preliminary examination fee (37 CFR 1.482) paid to USPTO but all claims did not satisfy provisions of PCT Article 33(1)-(4)..... \$ 710.00             International preliminary examination fee (37 CFR 1.482) paid to USPTO but all claims satisfied provisions of PCT Article 33(1)-(4)..... \$ 100.00   <div style="text-align: right;">ENTER APPROPRIATE BASIC FEE AMOUNT =</div> </div>				<b>CALCULATIONS PTO USE ONLY</b>	
				<div style="border: 1px solid black; padding: 5px; display: inline-block;">\$890.00</div>	

Surcharge of \$130.00 for furnishing the oath or declaration later than months from the earliest claimed priority date (37 C.F.R. 1.491(3)).				<input type="checkbox"/> 20 <input type="checkbox"/> 30	
				+ \$130.00	

CLAIMS	NUMBER FILED	NUMBER EXTRA	RATE		
Total Claims	6 - 20 =	-0-	x \$ 18.00		
Independent Claims	1 - 3 =	-0-	x \$ 84.00		
MULTIPLE DEPENDENT CLAIM(S) (if applicable)		-0-	+ \$280.00		
TOTAL OF ABOVE CALCULATIONS =				\$1,020.00	
<input type="checkbox"/> Applicant claims small entity status. See 37 CFR 1.27. The fees indicated above are reduced by 1/2.					
SUBTOTAL =				\$1,020.00	
Processing fee of \$130.00 for furnishing the English Translation later than months from the earliest claimed priority date (37 C.F.R. 1.492(f)).				<input type="checkbox"/> 20 <input type="checkbox"/> 30	
				+	
TOTAL NATIONAL FEE =				\$1,020.00	
Fee for recording the enclosed assignment (37 C.F.R. 1.21(h)). The assignment must be accompanied by an appropriate cover sheet (37 C.F.R. 3.28, 3.31). \$40.00 per property				+	
TOTAL FEES ENCLOSED =				\$1,020.00	
				Amount to be refunded:	
				Charged:	

a. <input checked="" type="checkbox"/>	A check in the amount of \$ 1,020.00 to cover the above fees is enclosed.
b. <input type="checkbox"/>	Please charge my Deposit Account No. _____ in the amount of \$ _____ to cover the above fees. A duplicate copy of this sheet is enclosed.
c. <input checked="" type="checkbox"/>	The Commissioner is hereby authorized to charge any additional fees which may be required, or credit any overpayment to Deposit Account No. 01.2000. A duplicate copy of this sheet is enclosed.
d. <input type="checkbox"/>	Fees are to be charged to a credit card. <b>WARNING:</b> Information on this form may become public. Credit card information should not be included on this form. Provide credit card information and authorization on PTO-2038.

**NOTE:** Where an appropriate time limit under 37 CFR 1.494 or 1.495 has not been met, a petition to revive (37 CFR 1.137(a) or (b)) must be filed and granted to restore the application to pending status.

SEND ALL CORRESPONDENCE TO:  
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Signature Date  
 GARY A. ESSMANN 29.376  
 Name Reg. No.

1515 Rec'd PCT/PTO 27 MAR 2002

U.S. APPLICATION NO. (if known, see 37 CFR 1.5) <b>10/089268</b>	INTERNATIONAL APPLICATION NO. PCT/EP00/09564	ATTORNEY'S DOCKET NUMBER 825-163
CERTIFICATE OF EXPRESS MAIL		
<p>I hereby certify that this correspondence is being deposited with the United States Postal Service with sufficient postage as EXPRESS MAIL-POST OFFICE TO ADDRESSEE, in an envelope addressed to: BOX PCT, COMMISSIONER OF PATENTS AND TRADEMARKS, WASHINGTON, D.C. 20231 on the 27th day of March, 2001. Express Mail Label EV 097314866 US.</p>		
GARY A. ESSMANN	29,376	
Name	Reg. No.	
	March 27, 2002	
Signature	Date	

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Application of: ) SHAFT SEAL, IN PARTICULAR FOR AN  
 ) AXIAL PISTON COMPRESSOR  
 OTFRIED SCHWARZKOPF )

**PRELIMINARY AMENDMENT**

Milwaukee, Wisconsin 53202  
 March 27, 2002

Box Patent Application  
 Asst. Commissioner for Patents  
 Washington, D.C. 20231

Sir:

It is requested that the U.S. national stage examination be carried out on the amended claims dated October 12, 2001. Prior to computing the filing fee in this application, kindly amend the above identified application, as follows. The filing fee is to be computed on the amended claims.

**In the Specification:**

Beginning at page 1, between the title and the first line of text, the specification has been amended as follows:

**CROSS REFERENCE TO RELATED APPLICATION**

The present application is the U.S. national stage application of International Application PCT/EP00/09564, filed September 29, 2000, which international application was published on April 5, 2001 as International Publication WO 01/23790 A1. The International Application claims priority of German Patent Application 199 47 007.3, filed September 30, 1999.

**In the Claims:**

Claim 3 has been amended as follows:

3. Axial piston compressor according to Claim 1, characterized in that the sliding ring (22) is provided with a groove (26) on its bearing surface that cooperates with the counter-ring (20).

Claim 4 has been amended as follows:

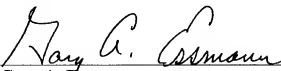
4. Axial piston compressor according to Claim 1, characterized in that the counter-ring (20) is provided with a groove.

Add the following new claims:

5. Axial piston compressor according to Claim 2, characterized in that the sliding ring (22) is provided with a groove (26) on its bearing surface that cooperates with the counter-ring (20).

6. Axial piston compressor according to Claim 2, characterized in that the counter-ring (20) is provided with a groove.

Respectfully submitted,

  
\_\_\_\_\_  
Gary A. Essmann  
(Reg. No. 29,376)

ANDRUS, SCEALES, STARKE & SAWALL, LLP  
100 East Wisconsin Avenue, Suite 1100  
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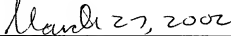
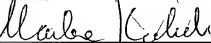
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Marlene Kubiak

Name

Reg. No.



Signature

Date

5

Shaft seal, in particular for an axial piston compressor

10 State of the art

The invention relates to a subassembly consisting of a drive shaft, a housing with an aperture through which the drive shaft projects out of the housing, and an axial face seal comprising a sliding ring and a counter-ring, which creates a seal between the components drive shaft and housing. Expressed more generally, the invention relates to the sealing of shaft exit apertures by means of a seal consisting substantially of a sliding ring and a counter-ring against which the sliding ring is pressed in the axial direction of the shaft. The invention relates in particular to an axial piston compressor in which the housing is closed by a cover plate within which is disposed the exit aperture for the drive shaft as well as an axial face seal for the drive shaft. Such a compressor, with a subassembly of the kind described above, is known from the patent EP 0 864 787 A2.

In the following the invention is described with reference to an exemplary application for an axial piston compressor such as can be used in particular in an air-conditioning unit for motor vehicles. However, as explained at the outset, the invention can be employed in general for machines that comprise an axial face seal.

An axial piston compressor in a vehicle air conditioner serves to suck in a coolant from a heat-transfer compartment, in which it evaporates while taking up heat, and to raise its pressure

by compression, so that in another heat-transfer compartment the coolant can release the heat again at a higher temperature level. Subsequently the coolant enters an expansion organ, where it is returned to the pressure level of the first heat-transfer compartment. The function of such axial piston compressors in such a coolant cycle is generally known, so that it need not be explained further here.

An especially important component of an axial piston compressor used in a vehicle air conditioner is the sealing element for the drive shaft. The shaft seal of an open compressor is of particular significance because leakages of the circulating coolant, in particular a coolant leakage through the the shaft seal, has a negative effect on the operating behaviour of the air conditioner by reducing the amount of coolant contained. Furthermore, it is prohibited to allow certain coolants to enter the atmosphere.

As shaft seals in axial piston compressors employing the coolant R134a radial shaft sealing rings are customarily used, because in the presence of the pressure differences encountered there, against which the seal must operate, these rings provide sufficiently reliable sealing at low cost. Such a radial shaft sealing ring is in general inserted into a recess on the outer surface of the housing.

Very recently it has become more common to employ the coolant CO<sub>2</sub> as a substitute for the coolant R134a, because CO<sub>2</sub> offers many advantages over R134a. However, the coolant CO<sub>2</sub> requires a higher pressure level than R134a, so that more technically demanding seals are needed. Therefore it is customary to use axial face seals, in which owing to the cooperation of sliding ring and counter-ring, which are pressed against one another, it is possible to obtain adequate sealing against the high pressure difference. The axial face seal, however, cannot be mounted on the outer surface of the housing, but rather must be disposed in the interior of the housing, for instance behind a



cover plate. Furthermore, the relative rotation between the sliding ring and the counter-ring generates so much frictional heat that a controlled dissipation of that heat seems desirable. However, in axial piston compressors for vehicle air  
5 conditioners no separate lubricant circulation is provided that could be used to carry away the frictional heat in the region of the sliding ring, nor does the mist of lubricant in the interior of the housing of the axial piston compressor suffice to dispose of the frictional heat produced.

- 10 The objective of the invention is thus to provide a shaft seal that can be mounted simply and economically and that enables good dissipation of the frictional heat that is generated.

#### Advantages of the invention

- 15 In a subassembly in accordance with the invention, with the characteristics given in the characterizing part of Claim 1, because the counter-ring is no longer a separate part that must be inserted into the cover plate, less effort is required for installation. Because the counter-ring itself need no longer be so stable that it can be manipulated and mounted as a separate  
20 component, it can be made considerably less thick than conventional counter-rings, which for example must be pressed into a recess. The diminished thickness of the counter-ring offers two advantages. First, it reduces the length of the whole structure. Second, it improves the heat dissipation. That  
25 is, although such counter-rings are customarily made of material with extremely poor thermal conductivity, because the counter-ring is less thick it can adequately conduct heat away from the component into which it is integrated. The thermal conductivity is also improved in comparison with state-of-the-  
30 art constructions in that the counter-ring is now directly connected to the relevant component rather than being partially isolated therefrom, for instance by O-rings that must be pressed into place to serve as seals for the counter-ring according to the state of the art.

The above term "integrated" is used in the sense of this application firstly to designate a unit in which the counter-ring is non-removably connected to the component on which it is seated, and secondly to indicate that said component is so  
5 configured that the counter-ring is formed by a section of the component itself.

According to one embodiment of the invention the counter-ring can be glued, welded or soldered to the component that supports it. By this means, with little effort the desired integral and  
10 gas-tight connection between counter-ring and supporting component is achieved.

According to another embodiment the counter-ring is formed by a coating applied to the relevant component, for example by means of a CVD or PVD process. This allows the counter-ring to be  
15 made particularly thin, so that the axial length of the overall structure is very small. Another result is that the heat conduction from the counter-ring to the supporting component is optimized, because no insulating intermediate layers are present. Still another advantage is that a counter-ring can be  
20 obtained, the surface of which needs no further treatment.

The coating is preferably a ceramic layer. A counter-ring so formed is especially resistant to wear and tear. After the ceramic coating has been applied, it is preferably treated mechanically so as to produce the desired low degree of surface  
25 roughness.

The ceramic coating preferably consists of SiC. Tungsten carbide is also a suitable material. Then the sliding ring can be made of impregnated hard carbide, which has proved an advantageous pairing with respect to friction. With such a  
30 frictional pairing it is preferable for the material with the better thermal conductivity, in this case SiC (with a thermal conductivity of 125 W/mK), to be used for the counter-ring, which then because it is integrated with the supporting

component conducts the frictional heat produced in the axial face seal better than would be the case for a configuration in which the impregnated hard carbide (with a thermal conductivity of 25 W/mK) was responsible for conducting heat away from the housing.

According to a preferred embodiment of the invention the counter-ring is made in one piece with the housing, in which case the latter consists of aluminium or an aluminium alloy. Such a housing part can be especially well coated with a layer of tungsten carbide, because the temperature of the housing part during the coating process does not exceed 200°C. Layer thicknesses of 0.1 mm to 1 mm can be achieved. By mechanical finishing, for example polishing, a surface roughness Ra of 0.06 mm can be obtained. The hardness of such a layer is 75-80 HRC.

According to another embodiment of the invention it is provided that the counter-ring is an integral component of the housing, i.e. is produced by working the surface of the housing itself. A prerequisite is that the cover plate be made of a material suitable for creating a seal in cooperation with the sliding ring. The counter-ring is then formed by processing an annular region of the cover plate in such a way as to achieve the required smooth surface.

According to the preferred embodiment of the invention, the sliding ring is provided with a groove on its bearing surface that cooperates with the counter-ring. This groove acts as an oil pocket. This interruption in the bearing surface of the sliding ring in effect produces two bearing surfaces one after the other, which increases the efficiency of the seal.

Alternatively, the counter-ring could be provided with a groove. It is also possible to make the bearing surface of the counter-ring convex or concave, so as to allow for deformations under the action of heat.

An axial piston compressor in accordance with the invention as described in Claim 14 offers the advantage that it is possible for the frictional heat that is generated to be especially well transferred from the counter-ring directly into the housing of the compressor. This reduces the warming of the axial face seal, which results in less thermal and mechanical distortion and deformation. Furthermore, installation is simplified because the counter-ring does not need to be separately inserted into the cover plate. Here the term "cover plate" is understood to mean the part of the housing that is provided with the exit opening for the drive shaft; depending on the structural design and nature of mounting of the compressor, this part can also be the central part of the housing. Economical advantages are also obtained, because in comparison to the state of the art two parts are eliminated, namely the counter-ring as a separate component and the O-ring that would otherwise be needed as a seal for the counter-ring. If leakage should occur in the region of the axial face seal, a new counter-ring can be installed with little effort simply by exchanging the cover plate.

Advantageous embodiments of the invention will be evident from the subordinate claims.

#### Drawings

In the following the invention is described with reference to the attached drawings, wherein

- Figure 1 shows an axial piston compressor according to the state of the art, in a schematic sectional view;

- Figure 2 shows on a larger scale a part of an axial piston compressor in accordance with the invention, corresponding to the region II in Figure 1.

# Description of the exemplary embodiment

In Figure 1 an axial piston compressor according to the state of the art is shown. It contains a housing 10 in which a drive shaft 12 is rotatably mounted. Seated on the drive shaft is a wobble plate 14 that cooperates with pistons 16. In Figure 1 only a single piston is visible; in fact, as many as seven pistons are provided, each of which is translationally displaceable within a cylinder. In the region where the drive shaft 12 emerges from the housing 10 there is disposed a cover plate 18 provided with an exit aperture 19 through which the drive shaft 12 passes out of the housing 10. Pressed into the cover plate is a counter-ring 20 with an O-ring 21. A sliding ring 22 makes contact with the counter-ring 20 and is pressed against the counter-ring by a spring 24. By this means an axial face seal is formed, which seals off the housing from the exterior space in the region of the exit aperture 19.

In Figure 2 the configuration of the seal in the region where the drive shaft 12 passes through the cover plate is shown for an axial piston compressor in accordance with the invention.

The counter-ring 20 is made integral with the cover plate 18, being formed by a thin layer of SiC. Apposed to the counter-ring 20 is the sliding ring 22, which can consist for example of impregnated hard carbide and is provided with a V-shaped groove 26 in its bearing surface.

The embodiment in accordance with the invention also employs a spring 24, which presses the sliding ring 22 against the counter-ring 20. The sliding ring is disposed in the interior of a spring holder 28, which together with a capture plate 30 ensures that a self-contained subassembly is formed. Between the sliding ring 22 and the drive shaft 12 an O-ring 32 is disposed; this ensures that the sliding ring 22 cannot rotate with respect to the drive shaft 12, so that rotation of the drive shaft causes a relative rotation between the sliding ring 22 and the counter-ring 20.

It is in principle also possible to reverse the arrangement of sliding ring and counter-ring: the counter-ring could be constructed in one piece with the drive shaft, for example on a shoulder of the shaft, and the sliding ring could be disposed  
5 on the housing, with a force applied to press it against the counter-ring.

List of reference numerals

- 10: Housing
- 12: Drive shaft
- 14: Wobble plate
- 5 16: Piston
- 18: Cover plate
- 19: Exit aperture
- 20: Counter-ring
- 21: O-ring
- 10 22: Sliding ring
- 24: Spring
- 26: Groove
- 28: Spring holder
- 30: Capture plate
- 15 32: O-ring

Amended October 12, 2001

- 10 -

## Claims

1. Axial piston compressor, in particular CO<sub>2</sub> axial piston  
5 compressor, with a drive shaft (12), a housing (10)  
incorporating an exit aperture (19) through which the  
drive shaft projects out of the housing, and an axial face  
seal with sliding ring (22) and counter-ring (20) that  
10 produces a seal between the two components drive shaft  
(12) and housing (10),  
characterized in that the counter-ring (20) forms an  
integral part of the housing (10).
2. Axial piston compressor according to Claim 1, the housing  
15 (10) of which comprises a cover plate (18) that is  
provided with an exit aperture (19) for the drive shaft,  
characterized in that the counter-ring (20) is formed in  
one piece with the cover plate (18).
3. Axial piston compressor according to Claim 1 or 2,  
20 characterized in that the sliding ring (22) is provided  
with a groove (26) on its bearing surface that cooperates  
with the counter-ring (20).
4. Axial piston compressor according to Claim 1 or 2,  
characterized in that the counter-ring (20) is provided  
with a groove.



## ABSTRACT OF THE DISCLOSURE

The invention relates to a subassembly, consisting of a drive shaft (12), a housing (10) with a through-bore (19), through which the drive shaft projects out of the housing and an axial mechanical seal consisting of a rotating seal ring (22) and a counter-  
5 ring (20) which forms a seal between the drive shaft (12) and housing (10) components.

The invention aims to improve the assembly of the axial mechanical seal and the thermal dissipation from said mechanical seal. To this end, the counter-ring (20) is configured as one single piece with one of the two components (10, 12). This obviates a separate assembly of the counter-ring and allows the heat produced by friction to be dissipated  
10 directly into one of the two components.

1/2

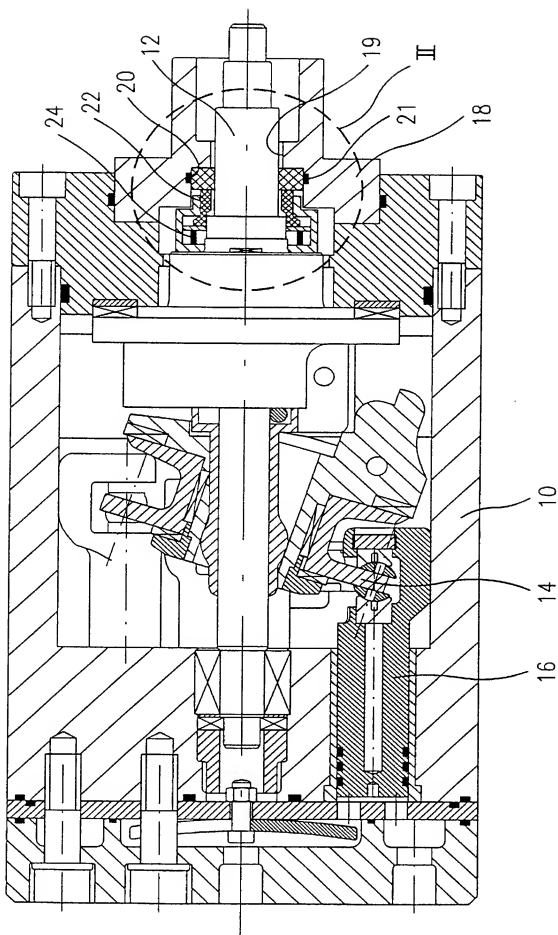


Fig. 1

2/2

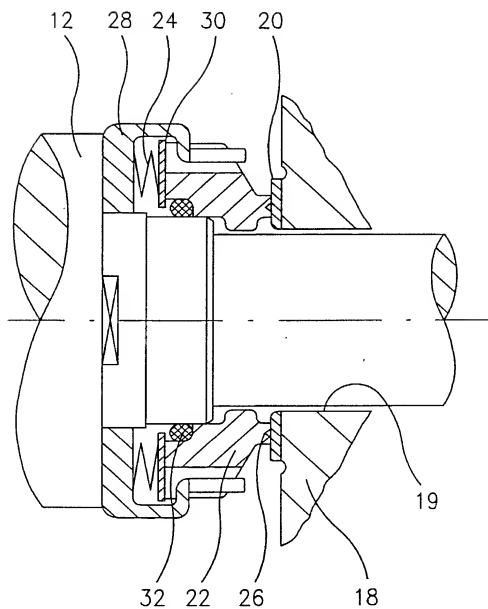


Fig. 2

1712EX-018-PC/US

Type a plus sign (+) inside this box [ + ]

Approved for use through 9/30/00  
Patent and Trademark Office: U.S. DEPARTMENT OF COMMERCE

PTO/SB/01 (8/96)	<b>DECLARATION</b>	
	Declaration <input type="checkbox"/> Submitted with Initial Filing	OR Declaration <input checked="" type="checkbox"/> Submitted after Initial Filing
	<b>COMPLETE IF KNOWN</b>	
	Attorney Docket Number	825-163
	First Named Inventor	Otfried Schwarzkopf
Application Number		
Filing Date		
Group Art Unit		
Examiner Name		

As a below named inventor, I hereby declare that:

My residence, post office address, and citizenship are as stated below next to my name.

I believe I am the original, first and sole inventor (if only one name is listed below) or an original, first and joint inventor (if plural names are listed below) of the subject matter which is claimed and for which a patent is sought on the invention entitled:

SHAFT SEAL, IN PARTICULAR FOR AN AXIAL PISTON COMPRESSOR

(Title of the Invention)

the specification of which

☐ is attached hereto

OR

☒ was filed on (MM/DD/YYYY) September 29, as United States Application Number or PCT

International Number PCT/EP00/09564 and was amended on (MM/DD/YYYY) October 12, 2001  
(if applicable).

I hereby state that I have reviewed and understand the contents of the above identified specification, including the claims, as amended by any amendment specifically referred to above.

I acknowledge the duty to disclose information which is material to patentability as defined in Title 37 Code of Federal Regulations, §1.56.

I hereby claim foreign priority benefits under Title 35, United States Code §119(a)-(d) or §365(b) of any foreign application(s) for patent or inventor's certificate, or §365(a) of any PCT international application which designed at least one country other than the United States of America, listed below and have also identified below, by checking the box, any foreign application for patent or inventor's certificate, or of any PCT international application having a filing date before that of the application on which priority is claimed.

Prior Foreign Application Number(s)	Country	Foreign Filing Date (MM/DD/YYYY)	Priority Not Claimed	Copy Attached?	
				YES	NO
199 47 007.3	Germany	09/30/99	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
			<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
			<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
			<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
			<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

☐ Additional foreign application numbers are listed on a supplemental priority sheet attached hereto:

I hereby claim the benefit under Title 35, United States Code §119(e) of any United States provisional application(s) listed below.

Application Number(s)	Filing Date (MM/DD/YYYY)	Additional provisional <input type="checkbox"/> Application numbers are listed on a supplemental priority sheet attached hereto.

Type a plus sign (+) inside this box [ + ]

# DECLARATION

I hereby claim the benefit under Title 35, United States Code §120 of any United States application(s), or §365© of any PCT international application designated the United States of America, listed below and, insofar as the subject matter of each of the claims of this application is not disclosed in the prior United States of PCT International application in the manner provided by the first paragraph of Title 35, United States Code §112. I acknowledge the duty to disclose information which is material to patentability as defined in Title 37, Code of Federal Regulations §1.56 which became available between the filing date of the prior application and the national or PCT international filing date of this application.

U.S. Parent Application Number	PCT Parent Number	Parent Filing Date (MM/DD/YYYY)	Parent Patent Number (if applicable)

☐ Additional U.S. or PCT international application numbers are listed on a supplemental priority sheet attached hereto.

As a named inventor, I hereby appoint the following attorney(s) and/or agent(s) to prosecute this application and to transact all business in the Patent and Trademark Office connected therewith:

Name	Registration Number	Name	Registration Number
Daniel D. Fetterley	<u>20,323</u>	Joseph D. Kuborn	<u>40,689</u>
George H. Solveson	<u>25,927</u>	William L. Falk	<u>27,709</u>
Gary A. Essmann	<u>29,376</u>	Jeffrey S. Sokol	<u>35,686</u>
Thomas M. Wozny	<u>28,922</u>		
Michael E. Taken	<u>28,120</u>		
Joseph J. Jochman, Jr.	<u>25,058</u>		

☐ Additional attorney(s) and/or agent(s) named on a supplemental sheet attached hereto.

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I hereby declare that all statements made herein of my own knowledge are true and that all statements made on information and belief are believed to be true; and further that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under §1001 of Title 18 of the United States Code and that such willful false statements may jeopardize the validity of the application or any patent issued thereon.

Name of Sole or First Inventor: ☐ A petition has been filed for this unsigned inventor

Given Name (first and middle (if any))	Family Name or Surname
OTFRIED	SCHWARZKOPF

Inventor's Signature	<i>Robert J. Schwamm</i>	Date	29/05/02
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RESIDENCE: City	Magstadt	State		Country	Germany	Citizenship	German
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City	Magstadt	State		Zip	D-71106	Country	Germany
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